

### 6 mm HD Blue +12 mm AS + 8 mm Clear

Make-up Name	Glass 1 & Coating	Glass 2 & Coating	Transmittance		Reflectance				U-Value Summer Day (W/m².K)	Shading Coefficient (sc)	Solar Heat Gain Coefficient (SHGC)	Color Rendering Index (Ra)
			Visible (τ <sub>v</sub> %)	Solar (τ <sub>e</sub> %)	Visible		Solar					
					ρ <sub>v</sub> % out	ρ <sub>v</sub> % in	ρ <sub>e</sub> % out	ρ <sub>e</sub> % in				
Default Make-up 01	Guardian HD Blue (Middle East) on Clear (Middle East)	Clear (Middle East)	23	19	21	30	16	29	2.62	0.35	0.31	97.9

Calculation Standard: NFRC 2010

#### Default Make-up 01

		Outdoors		Thermal Stress Guidance (COG) (°C)
GLASS 1	Clear (Middle East) Thickness = 1/4" = 6mm	#1 -----	#2 Guardian HD Blue (Middle East)	Caution 69.1
	GAP 1	100% Air, 12mm		
GLASS 2	Clear (Middle East) Thickness = 5/16" = 8mm	#3 -----	#4 -----	Go 45.3
	Total Unit (Nominal) = 26 mm		Slope = 90°	
Estimated Nominal Glazing Weight: 32.69 kg/m²				
		Indoors		

#### Important Notes

Calculations and terms in this report are based on NFRC 2010. The performance values shown above represent nominal values for the center of glass with no spacer system or framing.

#### Laminated products:

It is not guaranteed that modeled laminated configurations will be compliant with relevant laminated safety regulations unless specifically declared for Guardian products. It is the user's sole responsibility to assess if the final laminated product should be certified according to relevant standards and ensure compliance with laminated safety regulations.

Additional consequences for laminated glass with coating facing interlayer (due to contact between coating and interlayer) may include (not limited to): significant decrease of safety performance for some coating and interlayer combinations; loss of thermal insulation performance of surface facing the PVB; noticeable color change; other performance deterioration.

#### Non-specular products (translucent or diffuse):

The performance measurement for non-specular (translucent or diffuse) materials such as translucent interlayers or acid etched glass surface, or surface with ceramic frit is limited by the current experimental technologies. Since measurements capture physically only a part of the resulting radiation, calculated performance results provided herein and based on such measurements are not compliant with any standard (including EN 410) and may only be used as a general reference. Actual values may vary significantly based upon exact fabrication process, as well as type, thickness and color of used non-specular material.

Please note that the Thermal Stress Guideline is only a general guide to the thermal safety of a glazing, and it is not a replacement for detailed thermal stress analysis.

#### Explanation of Terms

**Visible Light Transmittance (T<sub>v</sub>, %)** is the percentage the incident lighting the wavelength range of 380 nm to 780 nm that is transmitted by the glass.

**Ultraviolet (UV) Transmittance (T<sub>uv</sub>, %)** is the percentage of the incident solar radiation transmitted by the glazing in the 300 nm to 380 nm range.

**Solar Energy Direct Transmittance (T<sub>e</sub>, %)** is the percentage of incident solar energy in the wavelength range of 300 nm to 2500 nm that is directly transmitted by the glass.

**Visible Light Reflectance Outdoors/Indoor (R<sub>v out/in</sub>, %)** is the percentage of incident visible light directly reflected by the glass.

**Solar Direct Reflectance Outdoors/Indoors (R<sub>e out/in</sub>, %)** is the percentage of incident solar energy directly reflected by the glass.

**Solar Energy Absorptance (A<sub>e</sub>, %)** is the percentage of the sun's energy that is absorbed by glass.

**U-Value** is the glazing parameter that characterizes the heat transfer through the central part of the glazing, i.e. without edge effects, and expresses the steady-state density of heat transfer rate per temperature difference between the environmental temperatures on each side. US Standard units are Btu/hr-ft<sup>2</sup>-F and SI / Metric units are W/m<sup>2</sup> K.

**Relative Heat Gain (RHG)** is the total net heat gain to the indoors due to both the air-to-air thermal conductance and the solar heat gain. US Standard units are Btu/hr.ft<sup>2</sup> and SI / Metric units are W/m<sup>2</sup>.

**Shading Coefficient (sc)** is Solar Factor divided by 0.87. It is a measure of the solar heat gain referenced to 3 mm clear glass which has the designated value of 1.00.

**Solar Heat Gain Coefficient (SHGC)** is the sum of the solar direct transmittance and the secondary heat transfer factor of the glazing towards the inside, the latter resulting from heat transfer by convection and longwave IR-radiation of that part of the incident solar radiation which has been absorbed by the glazing.

**Light-to-Solar Gain (LSG)** is the ratio of visible light gain to solar gain.  $LSG = (\text{Visible Transmittance}) / (\text{SHGC})$

**Color Rendering Index in transmission, D65 (R<sub>a</sub>)** is the change in color of an object as a result of the light being transmitted by the glass.

**Weighted Sound Reduction Index (R<sub>w</sub>)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

**Sound Transmission Class (STC)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

#### Disclaimer

This performance analysis is provided for the limited purpose of assisting the user in evaluating the performance of the glass products identified on this report.

Spectral data for products manufactured by Guardian reflect nominal values derived from typical production samples or CE Initial Type Testing and subject to variations due to manufacturing and calculation tolerances. Spectral data for products not manufactured by Guardian were derived from the LBNL International Glazing Database and have not been independently verified by Guardian. Guardian recommends a full-size mock-up be approved.

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Program Version: 4.1.0.8099  
Database Version: 20190402

## 6 mm HD Bronze +12 mm AS + 8 mm Clear

Make-up Name	Glass 1 & Coating	Glass 2 & Coating	Transmittance		Reflectance				U-Value Summer Day (W/m²·K)	Shading Coefficient (sc)	Solar Heat Gain Coefficient (SHGC)	Color Rendering Index (Ra)
			Visible (τ <sub>v</sub> %)	Solar (τ <sub>e</sub> %)	Visible		Solar					
					ρ <sub>v</sub> % out	ρ <sub>v</sub> % in	ρ <sub>e</sub> % out	ρ <sub>e</sub> % in				
Default Make-up 01	Guardian HD Bronze (Middle East) on Clear (Middle East)	Clear (Middle East)	21	15	14	10	17	19	2.46	0.30	0.26	95.5

Calculation Standard: NFRC 2010

### Default Make-up 01

		Outdoors		Thermal Stress Guidance (COG) (°C)
GLASS 1	Clear (Middle East)	#1 -----		Caution 71.4
	Thickness = 1/4" = 6mm	#2 Guardian HD Bronze (Middle East)		
GAP 1	100% Air, 12mm			
GLASS 2	Clear (Middle East)	#3 -----		Go 44.2
	Thickness = 5/16" = 8mm	#4 -----		
Total Unit (Nominal) = 26 mm		Slope = 90°		
Estimated Nominal Glazing Weight: 32.69 kg/m²				
		Indoors		

### Important Notes

Calculations and terms in this report are based on NFRC 2010. The performance values shown above represent nominal values for the center of glass with no spacer system or framing.

### Laminated products:

It is not guaranteed that modeled laminated configurations will be compliant with relevant laminated safety regulations unless specifically declared for Guardian products. It is the user's sole responsibility to assess if the final laminated product should be certified according to relevant standards and ensure compliance with laminated safety regulations.

Additional consequences for laminated glass with coating facing interlayer (due to contact between coating and interlayer) may include (not limited to): significant decrease of safety performance for some coating and interlayer combinations; loss of thermal insulation performance of surface facing the PVB; noticeable color change; other performance deterioration.

### Non-specular products (translucent or diffuse):

The performance measurement for non-specular (translucent or diffuse) materials such as translucent interlayers or acid etched glass surface, or surface with ceramic frit is limited by the current experimental technologies. Since measurements capture physically only a part of the resulting radiation, calculated performance results provided herein and based on such measurements are not compliant with any standard (including EN 410) and may only be used as a general reference. Actual values may vary significantly based upon exact fabrication process, as well as type, thickness and color of used non-specular material.

Please note that the Thermal Stress Guideline is only a general guide to the thermal safety of a glazing, and it is not a replacement for detailed thermal stress analysis.

### Explanation of Terms

**Visible Light Transmittance (TV, %)** is the percentage the incident lighting the wavelength range of 380 nm to 780 nm that is

transmitted by the glass.

**Ultraviolet (UV) Transmittance (T<sub>uv</sub>, %)** is the percentage of the incident solar radiation transmitted by the glazing in the 300 nm to 380 nm range.

**Solar Energy Direct Transmittance (T<sub>e</sub>, %)** is the percentage of incident solar energy in the wavelength range of 300 nm to 2500 nm that is directly transmitted by the glass.

**Visible Light Reflectance Outdoors/Indoor (R<sub>v out/in</sub>, %)** is the percentage of incident visible light directly reflected by the glass.

**Solar Direct Reflectance Outdoors/Indoors (R<sub>e out/in</sub>, %)** is the percentage of incident solar energy directly reflected by the glass.

**Solar Energy Absorptance (A<sub>e</sub>, %)** is the percentage of the sun's energy that is absorbed by glass.

**U-Value** is the glazing parameter that characterizes the heat transfer through the central part of the glazing, i.e. without edge effects, and expresses the steady-state density of heat transfer rate per temperature difference between the environmental temperatures on each side. US Standard units are Btu/hr.ft<sup>2</sup>.F and SI / Metric units are W/m<sup>2</sup> K.

**Relative Heat Gain (RHG)** is the total net heat gain to the indoors due to both the air-to-air thermal conductance and the solar heat gain. US Standard units are Btu/hr.ft<sup>2</sup> and SI / Metric units are W/m<sup>2</sup>.

**Shading Coefficient (sc)** is Solar Factor divided by 0.87. It is a measure of the solar heat gain referenced to 3 mm clear glass which has the designated value of 1.00.

**Solar Heat Gain Coefficient (SHGC)** is the sum of the solar direct transmittance and the secondary heat transfer factor of the glazing towards the inside, the latter resulting from heat transfer by convection and longwave IR-radiation of that part of the incident solar radiation which has been absorbed by the glazing.

**Light-to-Solar Gain (LSG)** is the ratio of visible light gain to solar gain.  $LSG = (\text{Visible Transmittance}) / (\text{SHGC})$

**Color Rendering Index in transmission, D65 (R<sub>a</sub>)** is the change in color of an object as a result of the light being transmitted by the glass.

**Weighted Sound Reduction Index (R<sub>w</sub>)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

**Sound Transmission Class (STC)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

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Program Version: 4.1.0.8099  
Database Version: 20190402

### 6 mm HD Green +12 mm AS + 8 mm Clear

Make-up Name	Glass 1 & Coating	Glass 2 & Coating	Transmittance		Reflectance				U-Value Summer Day (W/m².K)	Shading Coefficient (sc)	Solar Heat Gain Coefficient (SHGC)	Color Rendering Index (Ra)
			Visible (τ <sub>v</sub> %)	Solar (τ <sub>e</sub> %)	Visible		Solar					
					ρ <sub>v</sub> % out	ρ <sub>v</sub> % in	ρ <sub>e</sub> % out	ρ <sub>e</sub> % in				
Default Make-up 01	Guardian HD Green (Middle East) on Clear (Middle East)	Clear (Middle East)	30	26	28	21	16	22	2.68	0.42	0.37	94.3

Calculation Standard: NFRC 2010

#### Default Make-up 01

		Outdoors		Thermal Stress Guidance (COG) (°C)
GLASS 1	Clear (Middle East)	#1 -----	#2 Guardian HD Green (Middle East)	Caution 65.9
	Thickness = 1/4" = 6mm			
GAP 1	100% Air, 12mm			
GLASS 2	Clear (Middle East)	#3 -----	#4 -----	Go 45.1
	Thickness = 5/16" = 8mm			
Total Unit (Nominal) = 26 mm		Slope = 90°		
Estimated Nominal Glazing Weight: 32.69 kg/m²				
		Indoors		

#### Important Notes

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Additional consequences for laminated glass with coating facing interlayer (due to contact between coating and interlayer) may include (not limited to): significant decrease of safety performance for some coating and interlayer combinations; loss of thermal insulation performance of surface facing the PVB; noticeable color change; other performance deterioration.

#### Non-specular products (translucent or diffuse):

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#### Explanation of Terms

**Visible Light Transmittance (TV, %)** is the percentage the incident lighting the wavelength range of 380 nm to 780 nm that is

transmitted by the glass.

**Ultraviolet (UV) Transmittance (T<sub>uv</sub>, %)** is the percentage of the incident solar radiation transmitted by the glazing in the 300 nm to 380 nm range.

**Solar Energy Direct Transmittance (T<sub>e</sub>, %)** is the percentage of incident solar energy in the wavelength range of 300 nm to 2500 nm that is directly transmitted by the glass.

**Visible Light Reflectance Outdoors/Indoor (R<sub>v out/in</sub>, %)** is the percentage of incident visible light directly reflected by the glass.

**Solar Direct Reflectance Outdoors/Indoors (R<sub>e out/in</sub>, %)** is the percentage of incident solar energy directly reflected by the glass.

**Solar Energy Absorptance (A<sub>e</sub>, %)** is the percentage of the sun's energy that is absorbed by glass.

**U-Value** is the glazing parameter that characterizes the heat transfer through the central part of the glazing, i.e. without edge effects, and expresses the steady-state density of heat transfer rate per temperature difference between the environmental temperatures on each side. US Standard units are Btu/hr.ft<sup>2</sup>.F and SI / Metric units are W/m<sup>2</sup> K.

**Relative Heat Gain (RHG)** is the total net heat gain to the indoors due to both the air-to-air thermal conductance and the solar heat gain. US Standard units are Btu/hr.ft<sup>2</sup> and SI / Metric units are W/m<sup>2</sup>.

**Shading Coefficient (sc)** is Solar Factor divided by 0.87. It is a measure of the solar heat gain referenced to 3 mm clear glass which has the designated value of 1.00.

**Solar Heat Gain Coefficient (SHGC)** is the sum of the solar direct transmittance and the secondary heat transfer factor of the glazing towards the inside, the latter resulting from heat transfer by convection and longwave IR-radiation of that part of the incident solar radiation which has been absorbed by the glazing.

**Light-to-Solar Gain (LSG)** is the ratio of visible light gain to solar gain.  $LSG = (\text{Visible Transmittance}) / (\text{SHGC})$

**Color Rendering Index in transmission, D65 (R<sub>a</sub>)** is the change in color of an object as a result of the light being transmitted by the glass.

**Weighted Sound Reduction Index (R<sub>w</sub>)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

**Sound Transmission Class (STC)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

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Program Version: 4.1.0.8099  
Database Version: 20190402

## 6 mm HD Grey +12 mm AS + 8 mm Clear

Make-up Name	Glass 1 & Coating	Glass 2 & Coating	Transmittance		Reflectance				U-Value Summer Day (W/m <sup>2</sup> .K)	Shading Coefficient (sc)	Solar Heat Gain Coefficient (SHGC)	Color Rendering Index (R <sub>a</sub> )
			Visible (τ <sub>v</sub> %)	Solar (τ <sub>e</sub> %)	Visible		Solar					
					ρ <sub>v</sub> % out	ρ <sub>v</sub> % in	ρ <sub>e</sub> % out	ρ <sub>e</sub> % in				
Default Make-up 01	Guardian HD Grey (Middle East) on Clear (Middle East)	Clear (Middle East)	18	14	12	12	14	20	2.57	0.30	0.27	95.3

Calculation Standard: NFRC 2010

### Default Make-up 01

		Outdoors		Thermal Stress Guidance (COG) (°C)
GLASS 1	Clear (Middle East) Thickness = 1/4" = 6mm	#1 -----	#2 Guardian HD Grey (Middle East)	Caution 72.4
	GAP 1	100% Air, 12mm		
GLASS 2	Clear (Middle East) Thickness = 5/16" = 8mm	#3 -----	#4 -----	Go 45.7
	Total Unit (Nominal) = 26 mm		Slope = 90°	
Estimated Nominal Glazing Weight: 32.69 kg/m <sup>2</sup>				
		Indoors		

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**Visible Light Reflectance Outdoors/Indoor (R<sub>v out/in</sub>, %)** is the percentage of incident visible light directly reflected by the glass.

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Program Version: 4.1.0.8099  
Database Version: 20190402

### 8 mm HD Plus Blue +12 mm AS + 8 mm Clear

Make-up Name	Glass 1 & Coating	Glass 2 & Coating	Transmittance		Reflectance				U-Value Summer Day (W/m²·K)	Shading Coefficient (sc)	Solar Heat Gain Coefficient (SHGC)	Color Rendering Index (R <sub>a</sub> )
			Visible (τ <sub>v</sub> %)	Solar (τ <sub>e</sub> %)	Visible		Solar					
					ρ <sub>v</sub> % out	ρ <sub>v</sub> % in	ρ <sub>e</sub> % out	ρ <sub>e</sub> % in				
Default Make-up 01	SunGuard® HD Plus Blue T (Middle East) on Clear (Middle East)	Clear (Middle East)	12	10	11	13	12	16	2.54	0.27	0.24	94.9

Calculation Standard: NFRC 2010

#### Default Make-up 01

		Outdoors		Thermal Stress Guidance (COG) (°C)
GLASS 1	Clear (Middle East)	#1 -----		Stop 75.6
	Thickness = 5/16" = 8mm	#2 SunGuard® HD Plus Blue T (Middle East)		
GAP 1	100% Air, 12mm			
GLASS 2	Clear (Middle East)	#3 -----		Go 46.3
	Thickness = 5/16" = 8mm	#4 -----		
Total Unit (Nominal) = 28 mm		Slope = 90°		
Estimated Nominal Glazing Weight: 37.32 kg/m²				
		Indoors		

#### Important Notes

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#### Laminated products:

It is not guaranteed that modeled laminated configurations will be compliant with relevant laminated safety regulations unless specifically declared for Guardian products. It is the user's sole responsibility to assess if the final laminated product should be certified according to relevant standards and ensure compliance with laminated safety regulations.

Additional consequences for laminated glass with coating facing interlayer (due to contact between coating and interlayer) may include (not limited to): significant decrease of safety performance for some coating and interlayer combinations; loss of thermal insulation performance of surface facing the PVB; noticeable color change; other performance deterioration.

#### Non-specular products (translucent or diffuse):

The performance measurement for non-specular (translucent or diffuse) materials such as translucent interlayers or acid etched glass surface, or surface with ceramic frit is limited by the current experimental technologies. Since measurements capture physically only a part of the resulting radiation, calculated performance results provided herein and based on such measurements are not compliant with any standard (including EN 410) and may only be used as a general reference. Actual values may vary significantly based upon exact fabrication process, as well as type, thickness and color of used non-specular material.

Please note that the Thermal Stress Guideline is only a general guide to the thermal safety of a glazing, and it is not a replacement for detailed thermal stress analysis.

#### Explanation of Terms

**Visible Light Transmittance (Tv, %)** is the percentage the incident lighting the wavelength range of 380 nm to 780 nm that is transmitted by the glass.

**Ultraviolet (UV) Transmittance (Tuv, %)** is the percentage of the incident solar radiation transmitted by the glazing in the 300 nm to 380 nm range.

**Solar Energy Direct Transmittance (Te, %)** is the percentage of incident solar energy in the wavelength range of 300 nm to 2500 nm that is directly transmitted by the glass.

**Visible Light Reflectance Outdoors/Indoor (Rv out/in, %)** is the percentage of incident visible light directly reflected by the glass.

**Solar Direct Reflectance Outdoors/Indoors (Re out/in, %)** is the percentage of incident solar energy directly reflected by the glass.

**Solar Energy Absorptance (Ae, %)** is the percentage of the sun's energy that is absorbed by glass.

**U-Value** is the glazing parameter that characterizes the heat transfer through the central part of the glazing, i.e. without edge effects, and expresses the steady-state density of heat transfer rate per temperature difference between the environmental temperatures on each side. US Standard units are Btu/hr-ft<sup>2</sup>-F and SI / Metric units are W/m<sup>2</sup> K.

**Relative Heat Gain (RHG)** is the total net heat gain to the indoors due to both the air-to-air thermal conductance and the solar heat gain. US Standard units are Btu/hr.ft<sup>2</sup> and SI / Metric units are W/m<sup>2</sup>.

**Shading Coefficient (sc)** is Solar Factor divided by 0.87. It is a measure of the solar heat gain referenced to 3 mm clear glass which has the designated value of 1.00.

**Solar Heat Gain Coefficient (SHGC)** is the sum of the solar direct transmittance and the secondary heat transfer factor of the glazing towards the inside, the latter resulting from heat transfer by convection and longwave IR-radiation of that part of the incident solar radiation which has been absorbed by the glazing.

**Light-to-Solar Gain (LSG)** is the ratio of visible light gain to solar gain.  $LSG = (\text{Visible Transmittance}) / (\text{SHGC})$

**Color Rendering Index in transmission, D65 (Ra)** is the change in color of an object as a result of the light being transmitted by the glass.

**Weighted Sound Reduction Index (Rw)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

**Sound Transmission Class (STC)** is a single-number quantity which characterizes the airborne sound insulation of a material or building element over a range of frequencies.

#### Disclaimer

This performance analysis is provided for the limited purpose of assisting the user in evaluating the performance of the glass products identified on this report.

Spectral data for products manufactured by Guardian reflect nominal values derived from typical production samples or CE Initial Type Testing and subject to variations due to manufacturing and calculation tolerances. Spectral data for products not manufactured by Guardian were derived from the LBNL International Glazing Database and have not been independently verified by Guardian. Guardian recommends a full-size mock-up be approved.

The values provided herein are generated according to established engineering practices and applicable calculation standards. Many factors may affect glazing characteristics, including glass size, building orientation, shading, wind speed, type of installation, production process and others. The applicability and results of the analysis are directly related to user inputs and any changes in actual conditions can have a significant effect on the results. It is the responsibility of the users of the analysis to ensure that the intended application is appropriate and complies with all relevant laws, regulations, standards, codes of practices, processing guidelines and other requirements. Guardian makes no guarantee that any glazing modeled herein is available from Guardian or any other manufacturer. The user has the responsibility to check with the manufacturer regarding availability of any glass type or make-up.

While Guardian has made a good faith effort to verify the reliability of the tools used for this analysis, they may contain unknown programming errors that could result in inaccurate results. The user assumes all risk relating to the results provided and is solely responsible for selection of appropriate products for user's application. Guardian makes no express or implied warranty of any kind with respect to the tools used by Guardian and this analysis. There are no warranties of merchantability, non-infringement or fitness for a particular purpose with respect to the tools used by Guardian and this analysis and no warranty shall be implied by operation of law or otherwise. The only warranties applicable to Guardian products are those separately provided in writing for each product. In no event shall Guardian be liable for direct, indirect, special, consequential or incidental damages of any kind relating to or resulting from use of Guardian tools and analyses.

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